

Analysis the data of research work on nuclear physics: a bibliometric study

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Abstract:-

Nuclear Physics is a very important subject within the Physics. This field needs to be explored in research purpose. So for this important study bibliometric analysis is the best way. So this current work is devoted to analyse the data of the year of 2009 to 2018 taken from the Web of science database. Data has taken with the basic keyword 'nuclear physics'. Through this analysis it can be predict that how much research work has been already done by researches, and what are the benefits and other major drawbacks to do the research in this particular field.

Keywords: - Bibliometric study, Nuclear Physics, WOS.

Introduction:-

Nuclear physics is a basic key part of Physics. It deals with the particles, nucleus and atoms, to understand the universe. It can solve our keen quires from a small scale to a large scale. The development of atoms, many particles and then inter atomic forces between the atoms as well as particles can be defined with the help of nuclear physics itself. Nuclear physics can apply to develop such devices and technologies which can help in medical diagnostics and therapy. So as the field is very important in the application point of view, it needs to be explored. This is important to know how much research is going on for development of nuclear science field. For this purpose the keyword is bibliometric research.

Bibliometric research is defined by the OECD Glossary of Statistical Terms as: "The statistical analysis of books, articles, or other publications... to measure the "output" of individuals or research teams, institutions, and countries, to identify national and international networks, and to map the development of new (multi-disciplinary) fields of science and technology"^[1].

The term "Bibliometric" study is also known as Scientometric study. This kind of study is important to development of research fields based on analysis of related publications. It is a kind of quantitative analysis. It analyse the statistics about the publications and associated citations of any particular field, to check the current research status of that particular field. This study can be now use to evaluate the research performance all over the globe, specially performed in government labs, research institutes and various government as well as private universities. Nowadays, many researchers are doing well and good research on this bibliometric topic. This study is also known as science indicators studies, as with the help of librarian science researchers can analyse the data and can issue various bibliometric report ^[2]. Mohan B. Et al. discussed about the analysis of published Ph.D. thesis from all over the India on the remote sensing and GIS. They have taken the data from the Indcat website and analyse that data with various parameters. They have reported about 365 thesis on that particular remote sensing and GIS topic. In last they have concluded that in this particular field the state Andhra Pradesh and Andhra University contributed most thesis from all over the India ^[3]. Dalpe R. Has reported in his research work about the bibliometric analysis of biotechnology. The purpose of this study was to improve the quality of research and to upgrade the research of the biotechnology field. He has taken the data from the ISI database for analysis ^[4]. Garg K.C. et al. have discussed in their respective research about the bibliometric and Scientometric studies in India. They have taken the year span of 1995 to 2014 for their observation. So basically they have discussed about the research work other people had

been done on the bibliometric as well as Scientrometric study. They have reported with total 902 papers have been published in this particular field of study during that year of span. Though the bibliometric study has received a great importance and the papers with bibliometric law have received very less importance^[5]. Bibliometric studies can analyse the data of the literature for its content and analyse the data utilization. Bibliometric study mainly explores the data from indexes like Web of Science or Scopus^[1].

Research objective:-

The following are objective of the study:

- To Identify the Indian research contribution the field of Nuclear physics
- To examine the growth of Nuclear Physics in decade i.e. 2009-2018
- To identify the most preferred sources of publication and their nature of impact
- To examine the top cited document and references.
- To identify the most preferred sources of publication and their nature of impact.
- To Identify the top funding agency in the field of nuclear physics

Research methodology:-

Data with the subject, "Nuclear Physics" was searched and collected from the online Web of Science-comprising Science Citation Index (SCI), Social Sciences Citation Index (SSCI) and Arts & Humanities Citation Index (A&HCI) for the period from 2009 to 2018. This database was selected considering it the most reputed and comprehensive, total 1512 record were found. MS Excel was used for fulfilling the objective of study.

Table 1 Year wise publication (Annual Scientific Production)

Year	Articles	Percentage
2009	139	9.19
2010	143	9.46
2011	163	10.78
2012	149	9.85
2013	147	9.72
2014	150	9.92
2015	150	9.92
2016	166	10.98
2017	157	10.38
2018	148	9.79
Total	1512	100

Table 1 tabulates the year wise growth of the nuclear physics research in terms of publications. Publication always indicates about the research growth. Here data tabulated from 2009 to 2018, i.e. in total 1512 articles has been published related to nuclear physics research. From the data it can also be predicts that in 2016 maximum articles has been published but after words the trends of publish the work decrease day by day. So it can conclude that research should be more nowadays. Year wise data presentation can focus on the trend and growth of that particular field. Initially, nuclear physics was in trend of research but as it is very important field of research, so it needs more attention for research and development.

Table 2 Year wise publication with average citation per year

Year	No. of Articles	Mean Total Citation per Article	Mean Total Citation per Year	Citable Years
2009	139	9.70	0.97	10
2010	143	12.17	1.35	9
2011	163	7.83	0.98	8
2012	149	8.85	1.26	7
2013	147	7.76	1.29	6
2014	150	7.80	1.56	5
2015	150	4.86	1.22	4
2016	166	3.51	1.17	3
2017	157	3.28	1.64	2
2018	148	1.85	1.85	1

Table 2 predicts the year wise publication with the average citation per year and it clearly shows that mean of total citation per article is maximum reported in the year 2010. And then after 2012 it will gradually decrease. In 2018 it was reported as minimum as from the table it is 1.85. The range of the observatory year is taken as 2009 to 2018. Now mean total citation per year has been reported as maximum in 2018.

Table 3 Top source of publication along with impact

Name of Journal	H Index	G Index	M Index	Total Citation	No. of Publication	Publication Started
Nuclear Instruments & Methods in Physics Research Section B-Beam Interactions with Materials and Atoms	24	31	2.18	3226	459	2009
Nuclear Instruments & Methods in Physics Research Section A-Accelerators Spectrometers Detectors and Associated Equipment	22	36	2	2826	410	2009
Radiation Physics and Chemistry	27	35	2.45	3237	358	2009
Radiation Effects and Defects in Solids	11	13	1	772	266	2009
Nuclear Science and Techniques	4	4	0.36	26	11	2009
Concepts in Magnetic Resonance Part A	1	1	0.2	1	4	2015
Radiation Effects and Defects in Solids-Incorporating Plasma Science and Plasma Technology	2	2	0.2	7	4	2010

Table 3 reflects the year wise total no. of citations of the indexed journals. From the collected data it can be depict that the journal “Nuclear Instruments & Methods in Physics Research Section B-Beam Interactions with Materials and Atoms” has been published more work i.e. 459 in the year of 2009. But also with a comparative study it can be concluded that “Radiation Physics and Chemistry” journal has the maximum H-index (27) as well as M-index (2.45), “Nuclear Instruments & Methods in Physics Research Section A-Accelerators Spectrometers Detectors and Associated Equipment” journal has maximum G-index (36).As

the data reported here, very few journals are publishing the work of nuclear physics, which can be pointing out for more research.

Table 4 Name of Country along with no. of author contributed

Name of Country	No. of Authors
India	3123
USA	614
Italy	471
Germany	262
France	198
UK	165
Spain	145
Japan	139
South Korea	122
Russia	110
other 64	1146

Table 4 reflects the country wise contributions of author and it can show that India is country which is having more contribution towards the nuclear physics research. India has total 3123 authors who are working on this particular field. USA is following the trend of research with 614 author's contribution. But from the table data it can also be predicted that Russia is having only 110 authors who are working on nuclear physics. So this table can help one researcher to know for doing research in nuclear physics which country can be best.

Table 5 Most cited Country along with citation

Country	Total Citations	Average Article Citations
India	8319	6.25
USA	260	13
France	245	30.62
Italy	167	8.35
Korea	156	7.43
Germany	120	7.06
Russia	98	24.5
Switzerland	89	14.83
Israel	74	18.5
Saudi Arabia	65	10.83

Table 5 depicts the most cited country along with the citation in the field of nuclear physics in a descending order. Here from the collected data it can be concluded that India has the most citation in this field (8319), but the average article citation is less i.e. 6.25, which minimum in this data. In case of France the maximum average article citation is there i.e. 30.62. Among those countries Saudi Arabia has reported less no. of work in this nuclear physics field.

Table 6 Top Cited paper along with citation per year

Article	Total Citations	Total Citation per Year
Abadie J, 2010, NuclInstrum Meth A	107	11.889
Aubert B, 2013, NuclInstrum Meth A	93	15.5
AbazovVm, 2010, NuclInstrum Meth A	90	10
Rao Yn, 2010, Radiat Phys Chem	86	9.556
Muralithar S, 2010, NuclInstrum Meth A	83	9.222
Kumar V, 2012, Radiat Phys Chem	76	10.857
Palit R, 2012, NuclInstrum Meth A	74	10.571
Kumar V, 2012, NuclInstrum Meth B-A-B	73	10.429
Lees Jp, 2013, NuclInstrum Meth A	68	11.333
Dhabekar B, 2011, NuclInstrum Meth B	60	7.5

Table 6 depicts the top cited paper along with the citation per year. Abadie J, 2010, NuclInstrum Meth A article is having maximum no. of citations. This data is analysed that between the time period of 2009 to 2018 mostly paper cited in between 2010 to 2013.

Table 7 Top funding organisation

Funding Agencies	records	Percentage(%) of 1512
Department of Science Technology India	127	8.399
University Grants Commission India	122	8.069
Government Of India	88	5.82
Council Of Scientific Industrial Research Csir India	85	5.622
Department Of Atomic Energy Dae	59	3.902
Board Of Research In Nuclear Sciences Brns	53	3.505
Iuac New Delhi	26	1.72
Science Technology Facilities Council Stfc	23	1.521
United States Department Of Energy Doe	23	1.521
National Science Foundation Nsf	17	1.124

Table 7 depicts about the funding agencies of all over the India, who have already funded for several research works. Among them, Department of Science and Technology (DST), Govt. Of India has been funded most research work. As the record implies 127 research had been already done with the DST fund. National Science Foundation (NSF) has been funded very few i.e. 17 research works.

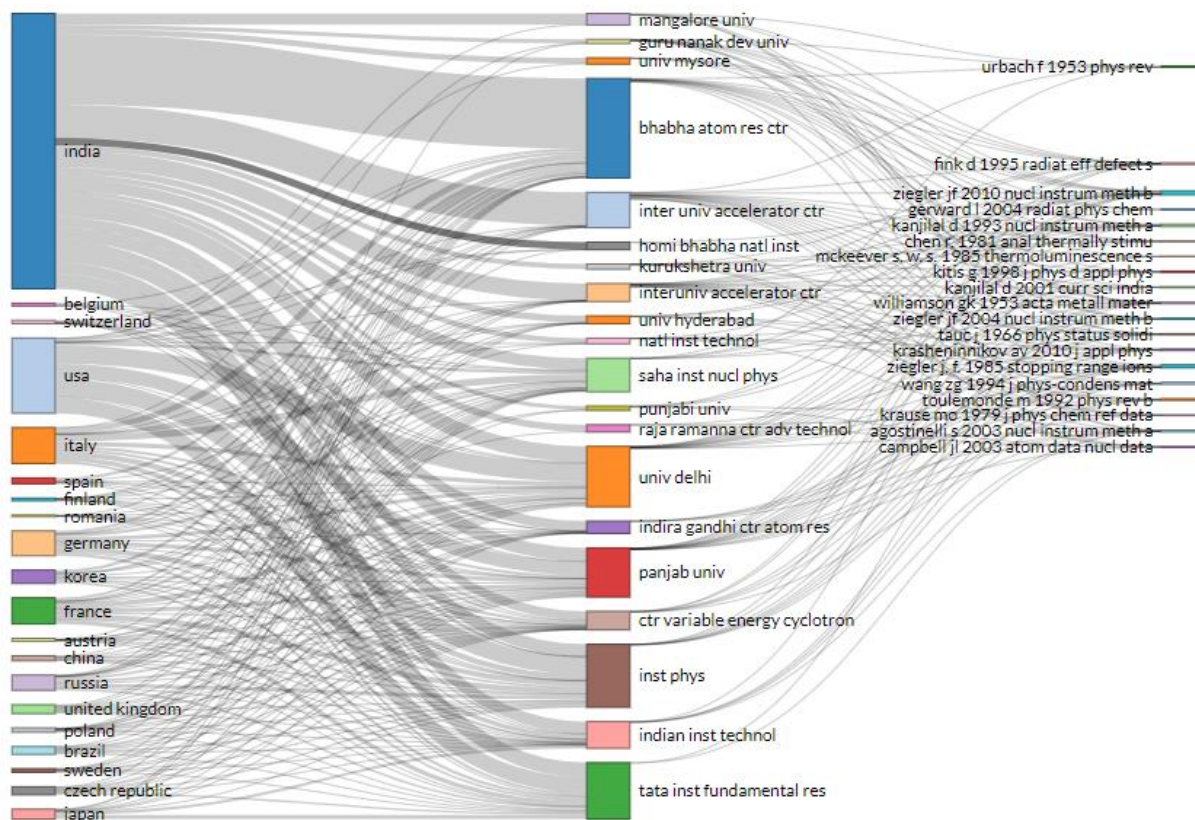


Figure: This figure represents the top 20 institutes of India collaborates with different countries for doing the research.

Conclusion

As the topic concern the nuclear physics is very important for application purpose. It can concern about the study of nucleus and associated particles. Their behaviour and properties one can study by the help of nuclear physics only. So to know the research impact of nuclear physics among the researchers this kind of bibliometric study is very useful. By this bibliometric study the information related to nuclear physics can be reveal and also researchers can predict the growth and trend of the research. So in this research work after collecting the data and analyse the data, it can predicted that an increasing research growth is there in the nuclear physics field. As the year wise growth of research article and citation of the research article has discussed. Also the top journals that has published maximum no. of work is also recorded and it can also be concluded that from this research work that India has contributed maximum research towards the nuclear physics field, with maximum cited publications. India has also many leading institutes like Bhava atomic research centre (BARC), University of Delhi etc. who are continuously contributing their research towards this field and helping to grow this field in terms of research and development.

Reference

1. <https://instr.iastate.libguides.com/c.php?g=49332&p=318077> (accessed on 25 november,2019).
2. http://ips.clarivate.com/m/pdfs/325133_thomson.pdf (accessed on 25 november, 2019).
3. Brij Mohan, Harbinder Pratap Singh and Shiv Singh, “ Education research and practice in remote sensing and GIS: A study of PhD researchers conducted in Indian universities and institutions from 1980 to 2016, International Journal of Applied Business and Economic Research, 15, 2017.
4. Dalpe. R, “ Bibliometric analysis of biotechnology”, Scientometrics, 55, 2002.
5. K.C. Garg and H.K. Tripathi, Bibliomeric and Scientrometric in India: an overview of studies during 1995-2014 part II: contents of articles in terms of disciplines and their bibliometric aspects” Annals of library and information studies, 65, 2018.